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Commentary

Development and Transmembrane Diffusion of Blood Brain Barriers

Vaz Klinken*

Department of Pathobiology of the Nervous System, Medical University of Vienna, Vienna, Austria

DESCRIPTION

The Blood Brain Barrier (BBB) is a significant barrier to drug delivery to the central nervous system. These include transmembrane diffusion, storable transporters, adsorptive endocytosis, and the extracellular pathways. Transmembrane diffusion is non-storable and depends, on first analysis, on the physicochemical characteristics of the substance. However, brain-to-blood efflux systems, enzymatic activity, plasma protein binding, and cerebral blood flow can all have a significant impact on the amount of substance that crosses the BBB. Transport systems are altered by physiological occurrences and disease states, and they about ten-fold increase the uptake of ligands [1].

A generic brain barrier, Adult mammalian brain barriers function as a monolayer of cells with intercellular tight junctions, decreased macro pinocytosis, and diminished fenestrae to regulate uncontrolled leakage. Variations on this theme can be found at the vascular brain barrier, the blood-CSF barrier, and specialty CNS barriers like the blood-retinal barrier. The majority of brain barriers include several of the other features mentioned. Pores are absorption transporters that are found at the luminal or abluminal membrane, can be energy dependent (as exemplified by P-glycoprotein), or energy independent (like GLUT-1), and transport in or out of the cytoplasm in a bidirectional or unidirectional manner. Brain barriers can secrete chemicals like cytokines, nitric oxide, and prostaglandins from either their CNS or peripheral side because they are enzymatically active, which can operate as an additional layer of barrier. The BBB serves functions other than preventing circulating substances from entering the CNS. Additionally, it secretes substances into the blood and CNS and enables and controls the entry of several compounds that are essential for CNS function. The BBB can control the CNS's homeostatic, nutritional, and immunological settings as well as the flow of the CNS and to regulate the exchange of informational molecules between the CNS and blood [2].

Transmembrane diffusion, most drugs cross the BBB by transmembrane diffusion. This is a non-saturable mechanism that is reliant on the drug integrating into the cell membrane. Lipid solubility also favours peripheral tissue absorption, which decreases the drug's blood concentration. Both the rate of transport across the BBB and the amount of drug supplied to the brain dictate the percentage of administered drug that enters the brain. To improve drug delivery to the brain, the use of lipid solubility must find a balance between increased BBB permeation and decreased blood concentrations. Lipophilic substances with low molecular weight are known to be P-glycoprotein substrates. P-glycoprotein efflux from the brain to the blood can significantly slow BBB uptake and is a major barrier to drug development. According to P-glycoprotein pharmacogenomics, approximately 30% of the population overexpresses it and thus is less sensitive to the CNS effects of its ligands, while approximately 25% of the population under expresses it. Individual differences have been linked to sensitivity to drugs used to treat AIDS and epilepsy [3].

Storable transport systems, some drugs or substances used for drug-like effects cross the BBB by use of storable transport systems. Some drugs or substances used for drug-like effects cross the BBB by use of storable transport systems. L-DOPA and caffeine are two examples, as are vitamins B12 and B6. The uptake rate of an endogenous ligand of a transporter across the BBB is approximately 10 times higher than would be expected if it crossed by transmembrane diffusion [4]. Additionally, many of the transporters for regulatory molecules, such as peptides and regulatory proteins, are selectively taken up by specific brain regions. Thus, the use of transporters provides the drug development field with not only high uptake rates for large, water soluble compounds, but also the ability to target specific regions of the CNS [5].

REFERENCES

1. Solomon M, Loeck M, Silva Abreu M, Moscoso R, Bautista R, Vigo M, et al. Altered blood-brain barrier transport of nanotherapeutics in lysosomal storage diseases. J Control Release. 2022; 349:1031-1044.
2. Balzer V, Poc P, Puris E, Martin S, Aliasgari M, Auriola S, et al. Re-evaluation of the hCMEC/D3 based *in vitro* BBB model for ABC transporter studies. Eur J Pharm Biopharm. 2022; 173:12-21.

Correspondence to: Vaz Klinken. Department of Pathobiology of the Nervous System, Medical University of Vienna, Vienna, Austria, E-mail: klinken.vaz.lu.ck@gmail.com

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3. Lee CS, Leong KW. Advances in microphysiological Blood Brain Barrier (BBB) models towards drug delivery. Curr Opin Biotechnol. 2020; 66:78-87.
4. Henao Restrepo JA, Wei L, Murrieta Coxca JM, Fuentes Zacarías P, Groten T, Markert UR, et al. Preeclampsia-derived EVs impair BBB and activate microglia *in vitro*. Placenta. 2022; 122:13.
5. Poustforoosh A, Nematollahi MH, Hashemipour H, Pardakhty A. Recent advances in Bio-conjugated nanocarriers for crossing the Blood-Brain Barrier in (pre-) clinical studies with an emphasis on vesicles. J Control Release. 2022; 343:777-797.